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EXPERIENCE IN USING SEPARATORS BASED ON RARE-EARTH PERMANENT MAGNETS TO ENRICH NONMETALLIFEROUS MATERIALS

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Érga NPF is the leading manufacturer of rare-earth permanent magnets and equipment based on them. When used for enriching the initial materials for making glass such equipment sharply reduces the Fe_2O_3 content in the initial materials and thereby improves the quality of the manufactured glass articles.

The large increase in the internal glass production volumes in Russia in the last few years has increased the volumes of glass quartz sands and other initial materials used — the demand for high-quality and cost-effective initial materials is growing rapidly. Under such conditions it is of great interest to use a technology for dry enrichment of the initial materials for making glass.

Dry-enrichment technology has undergone substantial changes in worldwide practice over the last 10 – 20 years. Magnetic separators based on rare-earth permanent magnets appeared after the development of the powerful rare-earth magnetic alloy Nd – Fe – B as a replacement for the cumbersome and energy-intensive electromagnets used to remove iron-containing mineral from the initial materials for making glass. The subsequent development of high-temperature magnetic alloys, making it possible to enrich hot (temperatures above 100°C) initial materials immediately prior to drying, and other improvements in the technology have made rare-earth enrichment separators a standard de facto.

The leading Russian manufacturer of rare-earth permanent magnets and equipment based on them is Érga NPF. Aside from a wide range of magnetic separators for removing magnetic metallic inclusions, Érga NPF manufactures enrichment systems which have no analogues in Russia that make it possible to attain consistently a low content of weakly magnetic iron oxide (Fe_2O_3) in initial raw material, and therefore improve the batch formula and glass color, and to decrease purchases of expensive pre-enriched initial materials.

The enrichment technology which we have developed and successfully implemented in practice includes three stages of removal of metallic inclusions with different magnetic susceptibility from the initial materials. Strongly magnetic inclusions are removed from the product stream using SMBM series magnetic drum separators. Weakly magnetic inclusions are subsequently removed from the material stream in a two-stage process on high-gradient magnetic rollers of the SMVI series separator.

The SMVI roller enrichment systems represent one of the most promising directions of the scientific and design work being done by specialists at Érga NPF. This direction combines the high-technology know-how for manufacturing superpowerful magnets and magnetic systems with many unique design features.

SMVI separators provide an effective method of enriching initial materials which quickly pays for itself, in contrast to the conventional methods. A SMVI magnetic separator uses a magnetic field with a high induction (from 1.3 to 1.6 T) and a large gradient, which greatly decreases the content of weakly magnetic impurities (specifically, Fe_2O_3) in the initial material.

TABLE 1.

Deposit, Mining and Enrichment Works (MEW)	Material	Fe_2O_3 content, wt.%	
		initial	after enrichment
MEW:			
"Muraevnya"	Quartz sand	0.065	0.035
Ramenskii	Same	0.034	0.017
Malyshevskii	Feldspar	0.103	0.059
Deposit:			
Balakhninskoe	Quartz sand	0.120	0.051
Tashlinskoe	Same	0.054	0.010
Ushinskoe	″	0.127	0.045
	″	0.047	0.026

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The effectiveness of the operation of the roller separators manufactured by Érga NPF corresponds to the western analogues. The results obtained using Érga NPF equipment to enrich the initial materials for making glass are presented in Table 1.

The integrated engineering approach to solving the problems of our partners, which makes our equipment as efficient as possible, includes a study of the enrichability of the initial material, a preliminary study of the technological processes, and a detailed individual analysis of the design of the separators and the parameters of the magnetic systems performed together with specialized scientific – research institutes and design organizations.

Our build-to-suit modern production of permanent magnets and magnetic systems is a guarantee that the ratio of the cost and quality of the equipment produced will be optimal. All equipment produced meets international quality standards. Our firm adopted the international quality system ISO 9001–2000 at the beginning of this year.